



## **Cisco CRS-1 Carrier Routing System 8-Slot Line Card Chassis Site Planning Guide**

March 2008

**Americas Headquarters**  
Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
<http://www.cisco.com>  
Tel: 408 526-4000  
800 553-NETS (6387)  
Fax: 408 527-0883

Text Part Number: OL-5802-06

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## Preface

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This *site planning guide* describes how to plan and prepare your site facilities for the installation of a Cisco CRS-1 Carrier Routing System 8-Slot Line Card Chassis (also referred to in this document as the “Cisco CRS-1 8-slot line card chassis”). The guide provides a brief description of the chassis and its components, and basic site facilities requirements.

This guide describes all power, cooling, and environmental specifications to consider before ordering and installing the Cisco CRS-1 8-slot line card chassis. This guide also describes site facilities requirements, such as floor space, weight requirements, receiving and staging, and installation information to help you plan the site where the routing system will be installed.



**Note**

The installation of a Cisco CRS-1 8-slot line card chassis may require space, floor loading, power, and cooling modifications to a facility; therefore, you should plan the site well in advance of the scheduled delivery of the system.

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## Audience

This guide is for customers who must plan the facilities for the site where the 8-slot line card chassis is to be installed. It should be used with Cisco Systems site planning coordinators and site inspections, well in advance of the delivery of the routing system.

## Document Organization

This guide contains the following chapters and appendixes:

- [Chapter 1, “Cisco CRS-1 Carrier Routing System,”](#) provides an overview of the routing system and its main components.
- [Chapter 2, “Power and Cooling,”](#) provides an overview of the chassis power and cooling systems, and describes the power and grounding requirements for the routing system.
- [Chapter 3, “Technical and Environmental Specifications,”](#) provides technical and environmental specifications.
- [Chapter 4, “Site Planning Considerations,”](#) describes the site facilities requirements to plan for before you receive and install the routing system.
- [Appendix A, “Site Planning Guidelines,”](#) provides checklists for the site preparation process.

- Appendix B, “Product IDs for the Cisco CRS-1 8-Slot Line Card Chassis,” provides information about how to order the Cisco CRS-1 8-Slot Line Card Chassis components.

## Document Conventions

This guide uses the following conventions:



**Caution**

Means *reader be careful*. You are capable of doing something that might result in equipment damage or loss of data.



**Note**

Means *reader take note*. Notes contain helpful suggestions or references to materials not contained in this manual.

## Warning Definition



**Warning**

### IMPORTANT SAFETY INSTRUCTIONS

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071

### SAVE THESE INSTRUCTIONS

See the *Regulatory Compliance and Safety Information for the Cisco CRS-1 Carrier Routing System* for translations of warnings and information about the compliance and safety standards with which the Cisco CRS-1 8-slot line card chassis system conforms.

## Related Cisco CRS-1 Documentation

For a complete listing of Cisco CRS-1 planning, installation, and configuration documents, see the following publications:

- Cisco CRS-1 Carrier Routing System Hardware Documentation Guide
- *About Cisco IOS XR Software Documentation*

See the “[Obtaining Documentation, Obtaining Support, and Security Guidelines](#)” section on page vii for information on obtaining these and other publications.

# Changes to This Document

lists the technical changes made to this document since it was first printed.

**Table 1** *Changes to This Document*

Revision	Date	Change Summary
OL-5802-06	February 2008	Minor editorial changes.
OL-5802-05	June 2007	This revision updates the two-pole DC power requirements.
OL-5802-04	June 2006	The front and rear clearance values for installation, service, and airflow have been updated in <a href="#">Chapter 4, “Site Planning Considerations.”</a>
OL-5802-03	April 2006	Various technical updates were made throughout the guide, especially in <a href="#">Chapter 3, “Technical and Environmental Specifications.”</a> Document titles for the Cisco CRS-1 8-slot line card chassis documentation set were updated. SIP and SPA product IDs were added to <a href="#">Appendix B “Product IDs for the Cisco CRS-1 8-Slot Line Card Chassis.”</a>
OL-5802-02	December 2005	Changes were made to external packaging dimensions. Callout was added to <a href="#">Figure 2-3.</a>
OL-5802-01A	March 2005	The DC power section was updated and new information was added. Product IDs were added for the redundant route processor (RP) and RP memory options. The document was updated to reflect that a set of horizontal shelf brackets is available as part of the installation kit (CRS-8-INSTALL-KT=).
OL-5802-01	December 2004	The initial release of this document.

# Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, obtaining support, providing documentation feedback, security guidelines, and also recommended aliases and general Cisco documents, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

<http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>





# CHAPTER 1

## Cisco CRS-1 Carrier Routing System

This *site planning guide* describes how to plan and prepare your site facilities for the installation of a Cisco CRS-1 Carrier Routing System 8-Slot Line Card Chassis (also referred to in this document as the “Cisco CRS-1 8-slot line card chassis”). The guide provides a brief description of the chassis and its components, and basic site facilities requirements.

This guide describes all power, cooling, and environmental specifications to consider before ordering and installing the Cisco CRS-1 8-slot line card chassis. This guide also describes site facilities requirements, such as floor space, weight requirements, receiving and staging, and installation information to help you plan the site where the routing system will be installed.



**Tip**

The installation of a CRS-1 8-slot line card chassis may require space, floor loading, power, and cooling modifications to a facility; therefore, you should plan the site well in advance of the scheduled delivery of the system.

The Cisco CRS-1 Carrier Routing System replaces much of the equipment in service provider points of presence (POPs) today. The routing systems are built around a scalable, distributed three-stage switch fabric and a variety of line card (packet) interfaces. These packet interfaces are located on modular services cards (MSCs) and their associated physical layer interface modules (PLIMs), which are effectively cross-connected to each other through the switch fabric.

- The Cisco CRS-1 8-slot line card chassis is a half-height, rack-mounted version of the 16-slot chassis. It is a highly scalable routing system that provides 640 gigabits per second (Gbps) of routing capacity and supports up to 8 MSCs. The chassis installs in a 19-inch equipment rack.

The Cisco CRS-1 8-slot line card chassis can be installed in colocation facilities, data centers, and many Tier II and Tier III locations. The routing system consists of a single rack-mounted chassis that contains the system components:

- Modular services cards (MSCs), also called line cards (up to eight)
- Physical layer interface modules, or PLIMs (up to eight, one for each MSC)
- Route processor (RP) cards (up to two)
- Switch fabric cards (four required)
- A chassis midplane that connects MSCs to their PLIMs and to switch fabric cards

The Cisco CRS-1 8-slot line card chassis has its own power and cooling subsystems.

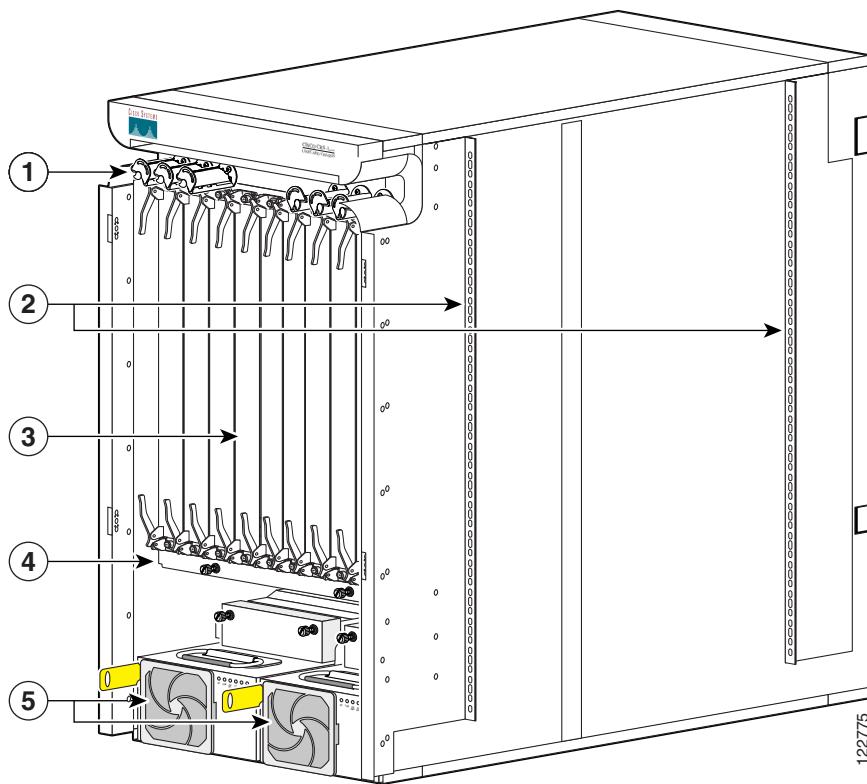
# The Cisco CRS-1 8-Slot Line Card Chassis

The Cisco CRS-1 8-slot line card chassis is the main component of the Cisco CRS-1. The chassis is a mechanical enclosure that contains a chassis midplane. The midplane holds the system modular services cards (MSCs), their associated physical layer interface modules (PLIMs), and switch fabric cards. The chassis is mounted in a 19-inch equipment rack. See the “[Equipment Rack Considerations](#)” section on page 4-3 for more information.

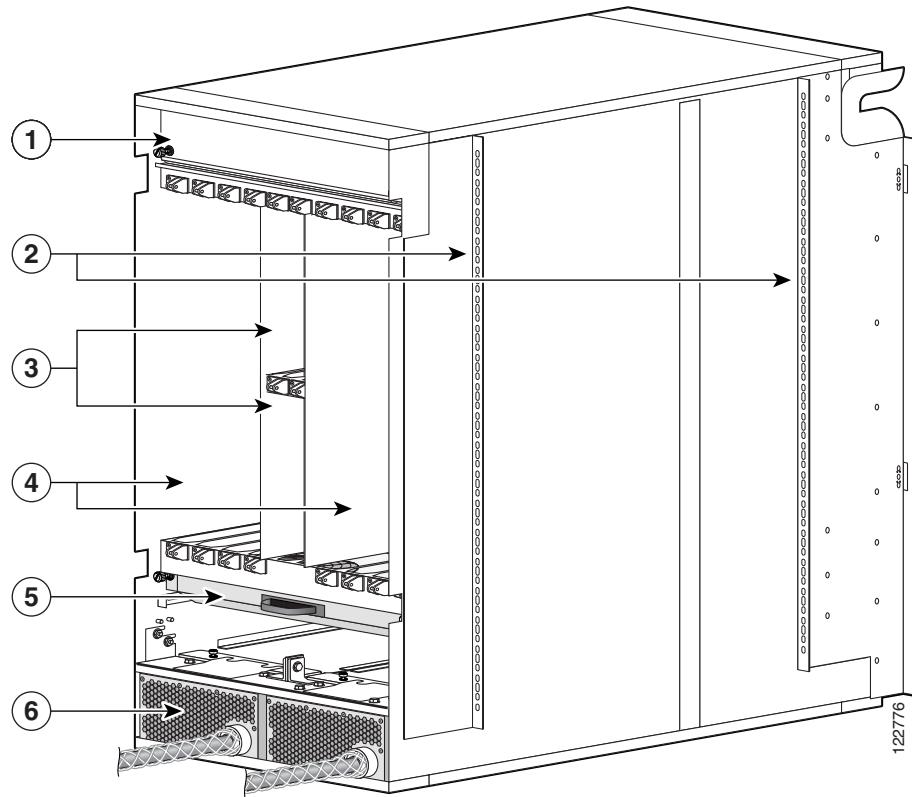
This section describes the main components of the Cisco CRS-1 8-slot line card chassis. It primarily identifies the components that are considered field-replaceable units (FRUs), but where additional detail is useful identifies subassemblies that are not field replaceable.

The following figures show the Cisco CRS-1 8-slot line card chassis from both the front (PLIM) and rear (MSC) sides.

**Figure 1-1** Front (PLIM) View of the 8-Slot Line Card Chassis



1	Cable management bracket	4	Air filter
2	Chassis vertical mounting brackets	5	Power modules
3	PLIM and RP slots (RPs in middle 2 slots)		

**Figure 1-2** Rear (MSC) View of the 8-Slot Line Card Chassis

<b>1</b>	Upper fan tray (beneath cover)	<b>4</b>	MSC slots
<b>2</b>	Chassis vertical mounting brackets	<b>5</b>	Lower fan tray
<b>3</b>	Switch fabric card (half-height) slots	<b>6</b>	Power distribution units (PDUs)

## Chassis Components

The Cisco CRS-1 8-slot line card chassis contains the following components:

- As many as eight modular services cards (MSCs), also called line cards, and eight physical layer interface modules (PLIMs). The MSC and PLIM are an associated pair of cards that mate through the chassis midplane. The MSC provides the forwarding engine for Layer 3 routing of user data, and the PLIM provides the physical interface and connectors for the user data.

The MSC can be associated with several different PLIMs, which provide different interface speeds and technologies. The available PLIMs are as follows:

- 1-port OC-768c/STM-256c packet-over-SONET (POS). Available with short-reach (SR) optics.
- 4-port OC-192c/STM-64c POS/DPT. Available with long-reach (LR), intermediate-reach (IR), short-reach (SR), and very-short-reach (VSR) optics.
- OC-48c/STM-16c POS/DPT, configurable with 1 to 16 ports. Available with long-reach (LR) and short-reach (SR) optics. This PLIM supports pluggable optics.

## The Cisco CRS-1 8-Slot Line Card Chassis

- 10-Gigabit Ethernet (GE). Available in long-reach (LR) optics. This PLIM supports pluggable optics, and can be configured with 1 to 8 ports.
- Cisco CRS-1 SPA Interface Processor-800. Occupies one physical-layer-interface-module (PLIM) slot on the Cisco CRS-1 16- and 8-Slot Line Card Chassis. Supports six normal-height SPAs or three double-height SPAs or any combination in between.
- A chassis midplane. The midplane connects MSCs to their associated PLIMs and allows an MSC to be removed from the chassis without having to disconnect the cables that are attached to the associated PLIM. The midplane distributes power, connects the MSCs to the switch fabric cards, and provides control plane interconnections. The midplane is not field replaceable by the customer.
- One or two route processor cards (RPs). The RPs provide the intelligence of the system by functioning as the line card chassis system controller and providing route processing. Only one RP is required for system operation. For redundant operation, you can order a second, redundant RP as an option (CRS-8-RP/R). When two RPs are used, only one RP is active at a time. The second RP acts as a “standby” RP, serving as a backup if the active RP fails.

The RP also monitors system alarms and controls the system fans. LEDs on the front panel indicate active alarm conditions.

- Upper and lower fan trays. The fans pull cool air through the chassis. A removable air filter is located below the PLIM card cage at the front of the chassis. Each fan tray contains three fans.
- Four half-height switch fabric cards. These cards provide the three-stage Benes switch fabric (S1/S2/S3) for the routing system. The switch fabric performs the cross-connect function of the routing system, connecting every MSC (and its associated PLIM) with every other MSC (and its associated PLIM) in the system.

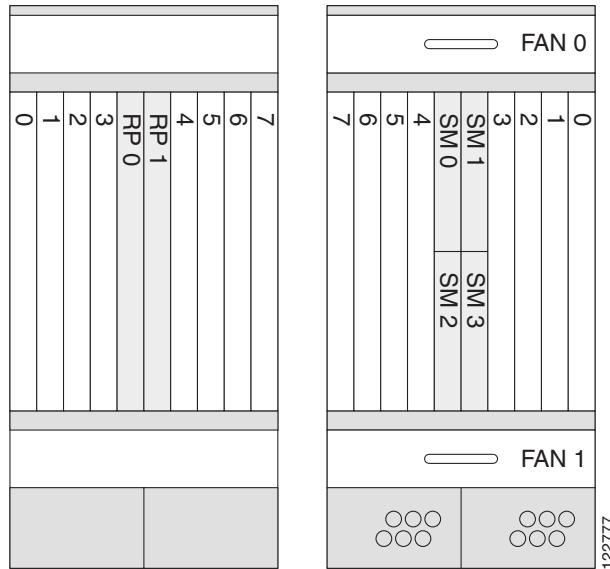
The switch fabric receives user data from one MSC and PLIM pair and performs the switching necessary to route the data to the appropriate egress MSC and PLIM pair. The switch fabric is divided into eight planes that evenly distribute the traffic across the switch fabric. Each switch fabric card implements two planes of the switch fabric.

- A power system that provides redundant power to the chassis. The power system consists of two AC or DC power distribution units (PDUs) and two AC rectifier modules or two DC power entry modules (PEMs), one for each PDU. Each PDU supplies input power to a rectifier or PEM, which in turn provides processed power to the chassis. Each DC and AC power module contains a removable air filter, located on the back of the module.

The PLIM side of the chassis is considered the front of the chassis, where user data cables attach to the PLIMs and cool air enters the chassis. The MSC side, which is where warm air is exhausted, is considered the rear of the chassis.

## Chassis Slot Numbers

The following figure shows the slot numbers on the front and back of the chassis.

**Figure 1-3 Cisco CRS-1 8-Slot Line Card Chassis Slot Numbers**

As shown, the front (PLIM) side of the chassis has the following card slots:

- Eight PLIM slots (left to right: 0, 1, 2, 3...4, 5, 6, 7)
- Two route processor card slots (RP0 and RP1)

The rear (MSC) side of the chassis has the following card slots:

- Eight MSC slots (left to right: 7, 6, 5, 4...3, 2, 1, 0)
- Four half-height switch fabric card slots (SM0, SM1, SM2, and SM3)

Notice that the PLIM and MSC slot numbers are reversed. This reversal is because each MSC mates with its associated PLIM through the midplane. For example, the PLIM in slot 0 (far left on the chassis front) mates through the midplane with the MSC in slot 0 (far right on the chassis rear).

■ The Cisco CRS-1 8-Slot Line Card Chassis



# CHAPTER 2

## Power and Cooling

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This chapter describes the Cisco CRS-1 Carrier Routing System 8-Slot Line Card Chassis power and cooling systems. It also provides the power and grounding and cooling requirements for the installation site to help you plan the site facilities for the system. The *Cisco CRS-1 Carrier Routing System 8-Slot Line Card Chassis System Description* provides detailed information about these components.

This chapter contains the following sections:

- [Chassis Power System](#)
- [General Power and Grounding Requirements](#)
- [DC Power Requirements](#)
- [AC Power Requirements](#)
- [Supplemental Bonding and Grounding](#)
- [Chassis Airflow](#)
- [Facility Cooling Requirements](#)

## Chassis Power System

The 8-slot line card chassis can be either DC or AC powered. Each type of power system (DC or AC) provides power to chassis components. The chassis power system is made up of two input power distribution units (PDUs) and two power modules, one in each PDU. Each PDU is connected to a different power source. Input power enters the PDU and is passed to the power module, which provides 7,500 watts of power to the components in the chassis. Each power module has its own circuit breaker.

The Cisco CRS-1 8-slot line card chassis uses the AC power PDUs to provide the two types of AC wiring schemes (Wye and Delta). Each chassis has two PDUs, and each PDU takes one supply which, in the case of AC, has three internal zones such that two three-zone power supplies provide three redundant power zones (see the *Cisco CRS-1 Carrier Routing System 8-Slot Line Card Chassis System Description* for more information).

Because each PDU is connected to a separate and independent power source, the power system provides 2N power redundancy. During normal operation when both power sources are operational, both sets of PDUs and power modules function together to power the chassis. However, if a power source fails, the other power source provides the other PDU and power module with enough input power to power the chassis. This 2N power redundancy enables the routing system to operate despite the power failure.

Chassis input power requirements are as follows:

- A DC-powered chassis requires 8,000 watts of DC input power.

**General Power and Grounding Requirements**

- An AC-powered chassis requires 8,750 watts of AC input power.

**Note**

These power requirements are for a fully loaded chassis with eight PLIMs. A chassis with six or seven PLIMs uses slightly less power. However, it is a good idea to allocate this much power for each chassis to ensure that enough power is available for future system expansion.

See the Cisco CRS-1 Carrier Routing System 8-Slot Line Card Chassis System Description for detailed information about how each power system operates and distributes power to components in the chassis.

## General Power and Grounding Requirements

This section describes the power and grounding requirements you must consider when planning the site facilities for the routing system. In addition, see the “[DC Power Requirements](#)” section on page 2-3 or the “[AC Power Requirements](#)” section on page 2-6 for additional information about the power requirements for your chassis type.

**Note**

A qualified electrician should review the information in these sections to ensure that the installation site meets these requirements. For larger system configurations, you may want to consult a facilities electrical expert to understand the load that the routing system may put on the facility power plant.

- Installation of the routing system must follow national and local electrical codes:
  - In the United States: United States National Fire Protection Association (NFPA) 70 and United States National Electrical Code (NEC).
  - In Canada: Canadian Electrical Code, part I, CSA C22.1.
  - In other countries: International Electrotechnical Commission (IEC) 60364, parts 1 through 7.
- Two separate and independent AC or DC power sources are needed to provide 2N redundancy for system power. Each power source requires its own circuit breaker.
- Each power source must be providing clean power to the site. If necessary, install a power conditioner.
- The site must provide short-circuit (over-current) protection for devices.
- Proper grounding is required at the site to ensure that equipment is not damaged by lightning and power surges. In addition:
  - For AC-powered systems, a grounding-type AC power outlet is required.
  - For DC-powered systems, each DC PDU requires a connection to earth ground.
- When planning the power for the site, be sure to include the power requirements for any external terminals and test equipment you will use with your system.

**Note**

Be sure to review the safety warnings in *Regulatory Compliance and Safety Information for the Cisco CRS-1 Carrier Routing System* before attempting to install the routing system.

# DC Power Requirements

A DC-powered line card chassis contains two DC-input power distribution units (PDUs) and two DC power entry modules (PEMs). Each DC PDU is connected to three DC power inputs and contains a single 7500-watt DC PEM that is field replaceable. Input DC power enters the PDU and is passed to the PEM, which provides power to the components in the chassis. Each PEM has its own circuit breaker.

In addition to the requirements described in the “[General Power and Grounding Requirements](#)” section on page 2-2, DC input power requirements are as follows:

- A DC-powered chassis requires 8,000 watts of DC input power.
- Each DC PDU requires three VDC inputs of –48/-60 VDC (nominal). The PDU accepts input DC power in the range –40.5 to –75 VDC.
- A DC-powered chassis requires access to the “A” and “B” power buses at the central office (CO). This dual connectivity provides 2N power redundancy in case a power source fails.
  - One PDU should be connected to three –48/-60 VDC inputs from the central office “A” power bus.
  - The other PDU should be connected to three –48/-60 VDC inputs from the “B” power bus.
- Required input current is as follows:
  - 60 amps at nominal input voltage (–48/-60 VDC)
  - 66 amps at low input voltage (–40.5 VDC).
- All power connection wiring must conform to the rules and regulations in the National Electrical Code (NEC) and any local codes. In addition, make sure that the wiring conforms to any internal requirements at the installation site.
- Each DC power source must comply with the safety extra-low voltage (SELV) requirements in UL 60950-1, CSA-C22.2 No. 60950-1, EN60950-1, AS/NZS 60950, and IEC60950-1.
- A DC-powered system should be installed in a restricted access area in accordance with the National Electric Code, ANSI/NFPA 70.
- All components in the area where DC input power is accessible must be properly insulated.
- A readily accessible two-pole disconnect device must be incorporated in the fixed wiring, unless it is possible to rely on the identification of the power return conductor that is earth-grounded in the DC power system.

## DC Input Power and Ground Cables

Each PDU has three sets of double-stud terminals (RTN, –48V/-60V) for connecting DC input power. To provide 2N power redundancy, one PDU should be connected to the central office “A” power bus and the other PDU should be connected to the “B” power bus.

The requirements for the DC input power and ground connections are as follows:

- For DC input power cables, select the appropriate wire gauge based on the National Electrical Code (NEC) and local codes for 60-amp service at nominal DC input voltage (–48/-60 VDC). Three pairs of cable leads, source DC (–) and source DC return (+), are required for each PDU. These cables are available from any commercial cable vendor. All input power cables for the chassis should have the same wire gauge and cable lengths should match within 10 percent of deviation.

**DC Power Requirements**

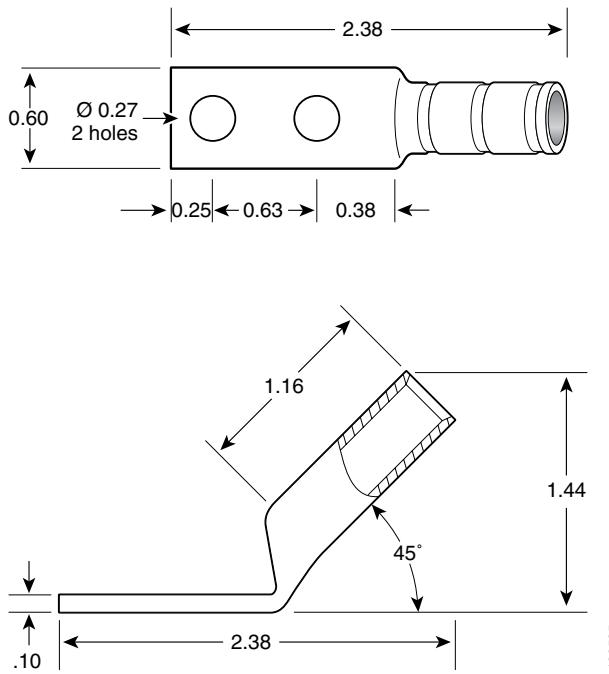
Each DC input power cable is terminated at the PDU by a cable lug. The cable lugs must be dual-hole, and have a 45-degree angle tongue. They must be able to fit over 1/4-inch terminal studs at 0.625-inch (15.88-mm) centers. For example, you could terminate a 2-AWG power cable with a cable lug, such as Panduit part number LCC2-14AWH-Q (Cisco part number 32-0677-01) or equivalent (see [Figure 2-1](#)).



**Note** To avoid hazardous conditions, all components in the area where DC input power is accessible must be properly insulated. Therefore, before installing the DC cable lugs, be sure to insulate the lugs according to the manufacturer's instructions.

**Figure 2-1 DC Input Power Cable Lug**

All measurements in inches



**Note** DC input power cables must be connected to the PDU terminal studs in the proper positive (+) and negative (-) polarity. In some cases, the DC cable leads are labeled, which is a relatively safe indication of the polarity. However, you must verify the polarity by measuring the voltage between the DC cable leads. When making the measurement, the positive (+) lead and the negative (-) lead must always match the (+) and (-) labels on the PDU.

- An earth ground cable is required for each DC PDU. We recommend that you use at least 6-AWG multistrand copper wire. This wire is not available from Cisco Systems; it is available from any commercial cable vendor.

The ground wire cable lug should be dual-hole (as shown in [Figure 2-2](#)) and able to fit over M6 terminal studs at 0.625-inch (15.88-mm) centers (for example, Panduit part number LCD6-14A-L or equivalent).

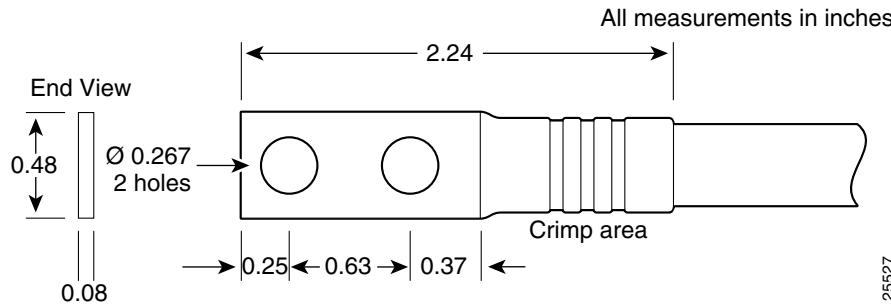
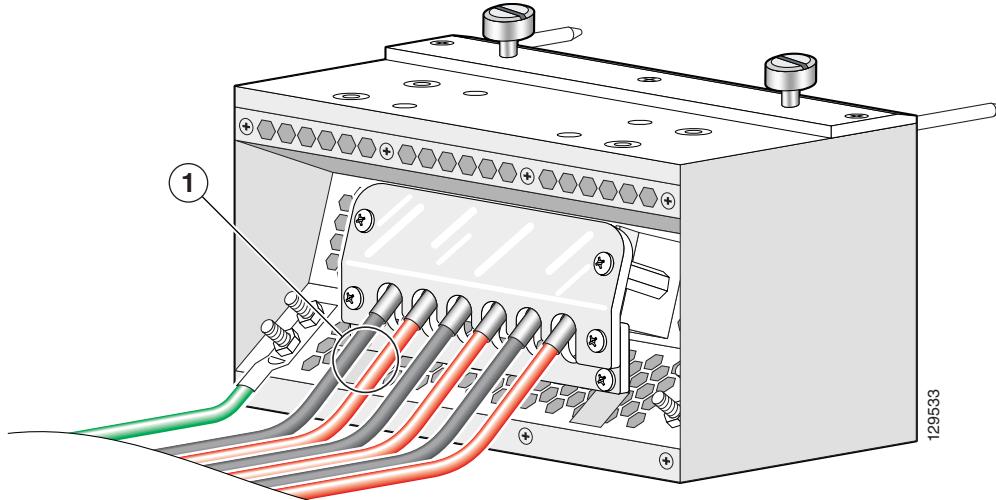
**Figure 2-2 DC Earth Ground Cable Lug**

Figure 2-3 shows the DC input power cables connected to the DC PDU terminal studs.

**Figure 2-3 DC PDU Power Cable Connections**

**1** Each set of cables (RTN and -48V/-60V) is a single VDC input.



**Note** When wiring the PDU, be sure to attach the ground wire first (shown above on the far left side of PDU). When removing the wiring, be sure to remove the ground wire last.



**Note** The power wire and ground wire connector screws have a 20 in.-lb torque value. The mounting screws have a 9 in.-lb torque value.

The color coding of the DC input power cable leads depends on the color coding of the site DC power source. Typically, green or green and yellow indicates that the cable is a ground cable. Because there is no color code standard for the source DC wiring, you must ensure that the power cables are connected to the PDU terminal studs in the proper positive (+) and negative (-) polarity.

**Caution**

Although reverse polarity should not damage the DC power system, you should correct a reverse polarity condition immediately.

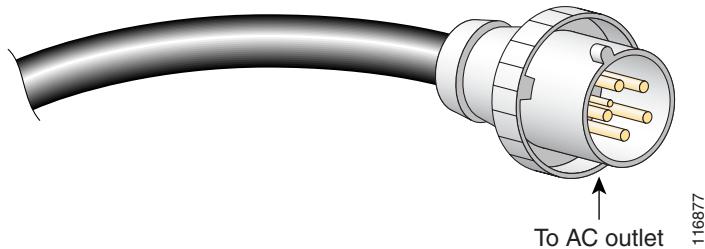
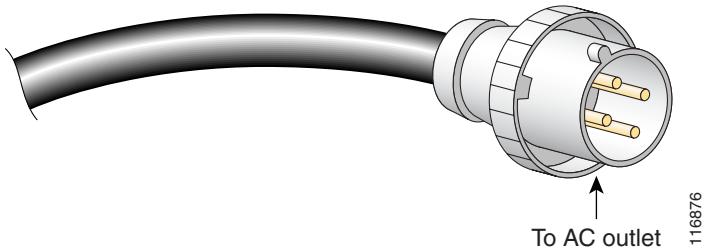
## AC Power Requirements

An AC-powered line card chassis contains two AC power distribution units (PDUs) and two AC rectifier modules. Each AC PDU is connected to an input AC power source and holds a single 7500-watt AC rectifier. Input AC power enters the PDU and is passed to the rectifier. Here, the input AC power is converted into the 54.5 VDC used to power components in the chassis. Each AC rectifier is field replaceable and has its own circuit breaker.

Two versions of the AC PDU are available to accommodate AC input power in either the Delta or Wye configuration. Each PDU has a different Cisco part number, and ships with an AC power cord that is 14 feet (4.3 m) long.

In addition to the requirements in the “[General Power and Grounding Requirements](#)” section on page 2-2, AC input power requirements are as follows:

- An AC-powered chassis (Wye or Delta) requires 8,750 watts of AC input power.
- Two separate and independent AC power sources are required, one for each PDU. Each PDU should be connected to a different power source to provide 2N power redundancy in case a power source fails.
- Each AC power source must provide 3-phase VAC power, and have its own circuit breaker.
- AC Delta input:
  - 3-phase, 200 to 240 VAC (phase-to-phase), 50 to 60 Hz.
  - Input current: 30 A. The PDU is rated for 24-amp service, and accepts AC input of 30 A.
  - The Delta power cord has a 4-pin NEMA L15-30P plug (3 wire + protective earthing<sup>1</sup> [3W+PE]). The power cord is rated for 250 VAC, 30 A, and plugs into a similarly rated NEMA L15-30R locking-type receptacle.
- AC Wye input:
  - 3-phase, 200 to 240 VAC (phase-to-neutral), 50 to 60 Hz.
  - Input current: 16 A (International) or 20 A (North America). The PDU is rated for 14-amp service, and accepts AC input of 16 or 20 A.
  - The Wye power cord has a 5-pin IEC 60309 plug (3 wire + neutral + protective earthing conductor (ground wire) [3W+N+PE]). The cord is rated for 400 VAC, 16 or 20 A, and plugs into a similarly rated IEC 60309 receptacle.
- A grounding-type AC power outlet is required. The PDUs are shipped with AC power cords that have a grounding-type plug. As a safety feature, the plugs fit only a grounding-type AC power outlet.

**Figure 2-4 AC Wye Power Cord Plug****Figure 2-5 AC Delta Power Cord Plug**

For detailed AC power specifications, see the “[Line Card Chassis Specifications](#)” section on page 3-1. In addition, the next section “[AC PDU Wiring](#)” describes the 3-phase wiring for AC Delta and Wye configurations.

## AC PDU Wiring

This section contains a brief description of the 3-phase wiring for AC Delta and Wye configurations that facilities electricians should understand.

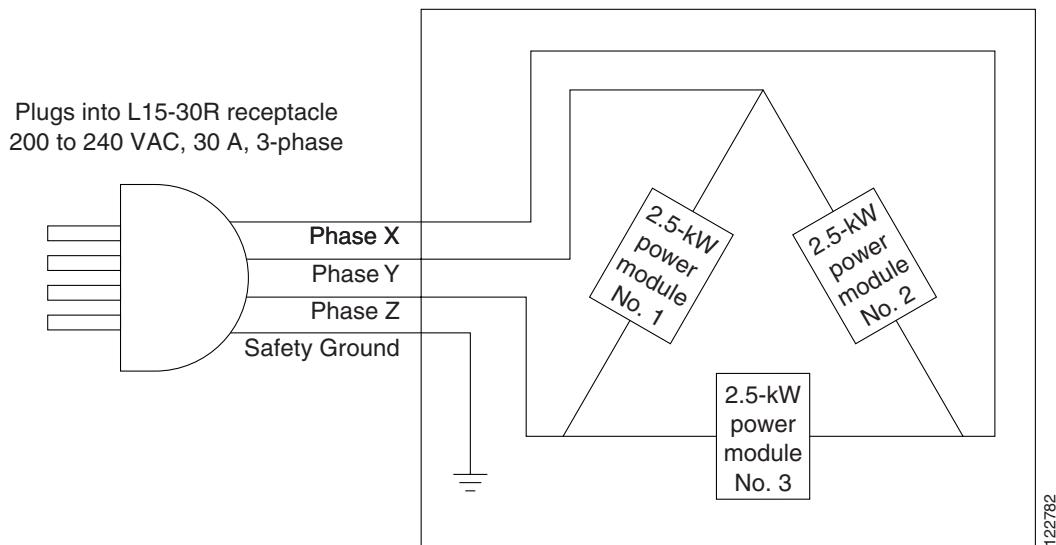
AC Delta and AC Wye are both basically 200 to 240 VAC input power:

- AC Delta 3-phase wiring is typically used in the United States, Japan, and other countries where the phase-to-neutral voltage is approximately 120 VAC and 208 VAC phase to phase.
- AC Wye 3-phase wiring is typically used in Europe and countries where each phase-to-neutral voltage is approximately 220 VAC.

## AC Delta 3-Phase Wiring

[Figure 2-6](#) shows a PDU wired for AC Delta 3-phase power. As shown, input AC power is routed to three internal 2.5-kW power modules in the rectifier, where it is converted into DC power (nominal 54.5 VDC, 46 ADC) and routed to the three load zones of the chassis.

The AC Delta PDU is shipped with a 14-foot (4.3 m) AC power cord with a 4-pin L15-30P plug.

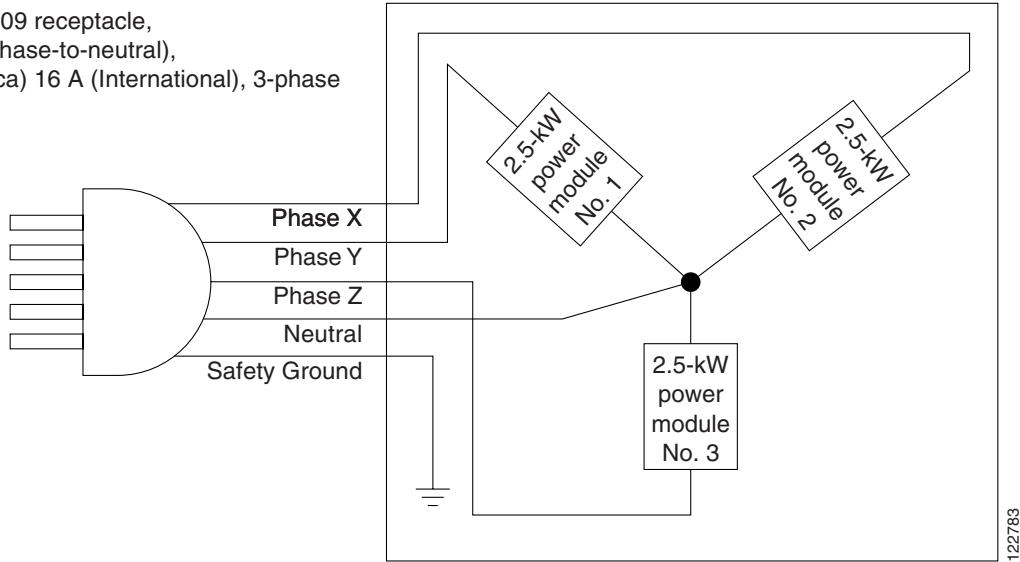
**■ AC Power Requirements****Figure 2-6 AC Delta PDU Wiring****AC Wye 3-Phase Wiring**

[Figure 2-7](#) shows a PDU wired for AC Wye 3-phase power. As shown, input AC power is routed to three internal 2.5-kW power modules in the rectifier, where it is converted into DC power (nominal 54.5 VDC, 46 ADC) and routed to the three load zones of the chassis.

The AC Wye PDU is shipped with a 14-foot (4.3 m) AC power cord. The power cord has a 5-pin IEC 60309 plug that is rated for 16 A (International) and 20 A (North America). It plugs into an IEC 60309 receptacle (16 or 20 A).

**Figure 2-7 AC Wye PDU Wiring**

Plugs into IEC 60309 receptacle,  
200 to 240 VAC (phase-to-neutral),  
20 A (North America) 16 A (International), 3-phase



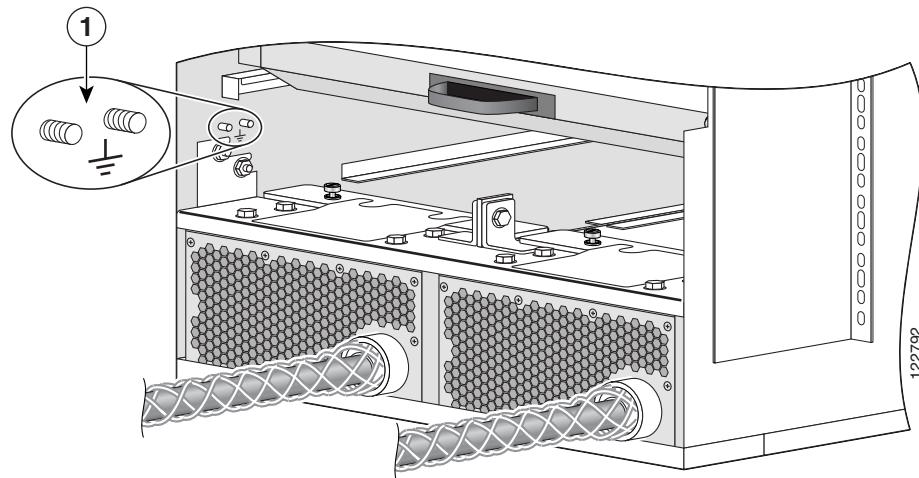
# Supplemental Bonding and Grounding

The 8-slot line card chassis has a safety earth ground connection as part of the power cabling to the PDUs. The chassis also has supplemental bonding and grounding points (two threaded ground inserts) that you can use to connect the router to the central office ground system or interior equipment grounding system. Also referred to as the network equipment building system (NEBS) bonding and grounding stud, these grounding points are located at the rear (MSC side) of the chassis (see [Figure 2-8](#)).


**Note**

The NEBS bonding and grounding points are intended to satisfy the Telcordia NEBS requirements for supplemental bonding and grounding connections. If you are not installing the router in a NEBS environment, you can skip these guidelines and rely on the safety earth ground connection for the PDUs.

**Figure 2-8 NEBS Bonding and Grounding Points (Rear of Chassis)**



**1** NEBS bonding and grounding points

To connect the chassis to a supplemental ground connection, you must have the following:

- A grounding lug that has two M6 bolt holes with 0.625- to 0.75-inch (15.86- to 19.05-mm) spacing between them, and a wire receptacle large enough to accept a 6-AWG or larger multistrand copper wire. The lug is not available from Cisco Systems; it is available from electrical-connector vendors.
- Two M6 or equivalent hex-head bolts with locking washers and nuts (nickel-plated brass is ideal). These bolts, locking washers, and nuts are not available from Cisco Systems; they are available from any commercial hardware vendor.
- A grounding wire. Although we recommend at least 6-AWG multistrand copper wire, the actual wire diameter and length depend on your router location and site environment. This wire is not available from Cisco Systems; it is available from any commercial cable vendor.


**Caution**

The DC Return of the Cisco CRS-1 8-slot chassis should remain isolated from the system frame and chassis (DC-I: Isolated DC Return).

For additional information about NEBS, see *Cisco CRS-1 Carrier Routing System Regulatory Compliance and Safety Information*.

## ■ Chassis Airflow

# Chassis Airflow

The Cisco CRS-1 8-slot line card chassis has two fan trays, with three fans each, that cool the chassis card cages. Cool air flows in at the bottom front of the chassis and flows through the chassis card cages and through the fans in the fan trays before being exhausted through the bottom rear of the chassis (see Figure 2-9).

In addition, each AC or DC power module at the bottom of the chassis has self-contained fans that pull in cool air from the front of the chassis and exhaust warm air out the rear.

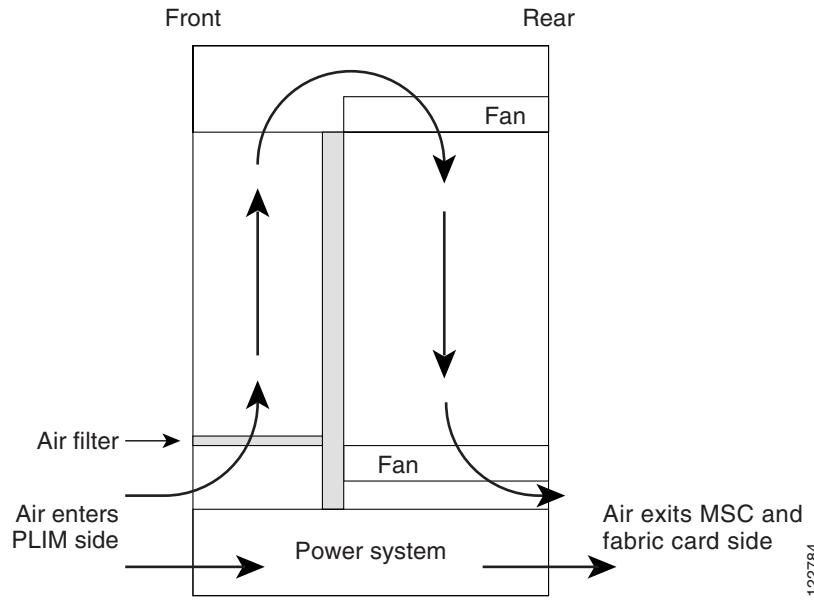
A replaceable air filter is located on the front of the chassis below the PLIM card cage. Each power module also has a replaceable air filter that attaches to the module at the front side of the chassis. How often you should replace the air filters depends on the facility environment.

In a dirty environment or when you start getting frequent temperature alarms, you should always check the intake grills for debris, and then check the air filters to see if they need to be replaced.



**Note** We recommend that you check the air filters once a month. Replace a filter when you notice a significant amount of dust.

**Figure 2-9** *Airflow Through the 8-Slot Line Card Chassis*



122784

The 8-slot line card chassis airflow volumes are as follows:

- Chassis airflow: Up to 900 cubic feet (25,485 liters) per minute
- Power system airflow: Up to 240 cubic feet (6800 liters) per minute

# Facility Cooling Requirements

The 8-slot line card chassis dissipates considerable power that generates much heat. In large configurations, additional air cooling is required to maintain correct operating temperatures. The room air must be cooled by external cooling units that are installed as part of the routing system.

Heat dissipation and external cooling requirements for the 8-slot line card chassis are as follows:

- Heat dissipation: 27,350 BTUs per hour
- External cooling requirements: 2.3 tons

To ensure that the site provides the proper air circulation for the system:

- Make certain that the site is as dust free as possible. Dusty environments can clog the air filter or power supply intake vents, reducing the cooling airflow through the system.
- Allow sufficient airflow by maintaining a minimum of 6 inches (15.2 cm) of clearance at both the inlet and exhaust openings on the chassis and the power modules. If airflow is blocked or restricted, or if inlet air is too warm, an over-temperature condition can occur. Under extreme conditions, the environmental monitoring system shuts down the power to protect the routing system components.

■ Facility Cooling Requirements



# CHAPTER 3

## Technical and Environmental Specifications

This chapter summarizes the technical and environmental specifications for the Cisco CRS-1 Carrier Routing System 8-Slot Line Card Chassis. It includes the following sections:

- [Line Card Chassis Specifications](#)
- [Equipment Rack Specifications](#)
- [Environmental Specifications](#)

## Line Card Chassis Specifications

The following table lists the system specifications for the Cisco CRS-1 8-slot line card chassis.

**Table 3-1 8-Slot Line Card Chassis Component and Power Specifications**

<b>Supported Cards and Modules</b>	8 modular services cards (MSCs) 8 physical layer interface modules (PLIMs), one for each MSC 4 switch fabric cards (SFCs) 2 route processors (RPs) 1 distributed route processor (DRP) 2 fan trays (with three fans per fan tray) 1 air filter
<b>Power Distribution Units</b>	2 AC (Wye or Delta) or 2 DC power distribution units (PDUs) (cannot mix AC and DC PDUs in the chassis)
DC PDU	Supports 1 DC power entry module (PEM)
AC PDU	Supports 1 AC rectifier module
<b>Maximum Power Consumption</b> (total input power)	
Maximum DC	8.0 kW
Maximum AC	8.75 kW (Delta or Wye 3-phase)

**Table 3-1 8-Slot Line Card Chassis Component and Power Specifications (continued)**

	<b>Note</b>	Proper grounding is also required at the site to ensure that equipment is not damaged by lightning or power surges.
<b>Power Redundancy (2N)</b>		
DC		Three “A” battery plant feeds required for one PDU, and three “B” battery plant feeds required for the other PDU.
AC (Delta or Wye 3-phase)		Two independent Delta or Wye 3-phase power sources required, one for each PDU.
<b>DC Input</b>		
Nominal input voltage		–48 VDC North America –54 VDC Telco (RBOC) –60 VDC International (range –40.5 to –75 VDC)
Input current		60 A at –48/–60 VDC (nominal voltage) 66 A at –40.5 VDC (low voltage extreme)
<b>AC Input, Delta 3-phase</b>		3W + PE (3 wire + protective earthing conductor ground wire)  Input voltage 3-phase 200 to 240 VAC, phase-to-phase (nominal) (range 170 to 264 VAC, phase-to-phase)
Line frequency		50 to 60 Hz (range 47 to 63 Hz)
Input current (PDU rated for 24 A)		30 A
<b>AC Input, Wye 3-phase</b>		3W + N + PE (3 wire + neutral + protective earthing conductor ground wire)  Input voltage 3-phase 200 to 240 VAC, phase-to-neutral (nominal) (range 170 to 264 VAC, phase-to-neutral) (range 295 to 457 VAC, phase-to-phase)
Line frequency		50 to 60 Hz (nominal) (range 47 to 63 Hz)
Input current (PDU rated for 14 A)		16 A International 20 A North America

## Equipment Rack Specifications

Cisco Systems has tested the Cisco CRS-1 8-slot line card chassis to Cisco internal mechanical design verification testing and electrical design verification testing in an Enclosure Systems Worldwide ESW 27 rack (part number F-01941-01). This finding is neither an endorsement nor recommendation for any particular rack product. The Cisco CRS-1 product documentation will be updated with additional information. Use this information for planning only. Consult your Cisco account representative for additional details.

If you plan to install the chassis in your own four-post rack, make sure that the rack meets the specifications summarized in [Table 3-2](#).

**Table 3-2 8-Slot Line Card Chassis and Equipment Rack Specifications**

<b>8-Slot Line Card Chassis Specifications</b>	
<b>Chassis Dimensions</b>	
Height	38.5 in. (97.8 cm)
Width	17.5 in. (44.5 cm) 18.9 in. (48.0 cm) mounting rail flange, outside to outside
Depth	36.6 in. (93.0 cm) without cosmetics 40.5 in. (102.9 cm) with full cosmetics and front and rear doors
<b>Chassis Weight</b>	
Chassis shipping weight	418.3 lb (189.7 kg) chassis with shipping crate and pallet 330.8 lb (138 kg) chassis with fans, PDUs, and blanks (as shipped)
Chassis with all cards and power modules, no cosmetics	600 lb (272.2 kg)
Chassis, fully loaded with line cards and full cosmetics (doors, panels, grilles, and so on)	650 lb (294.8 kg)
<b>Equipment Rack Specifications</b>	
<b>Rack Dimensions</b>	
Height	Available aperture in rack for two chassis in a single rack: <ul style="list-style-type: none"> <li>• 78.6 in. (199.6 cm)</li> </ul>
Width	Vertical posts: <ul style="list-style-type: none"> <li>• 19.5 in. (49.5 cm) inside-to-inside minimum</li> <li>• 23.6 in. (60.0 cm) outside-to-outside maximum</li> </ul>
Depth	Exterior of four-post rack: <ul style="list-style-type: none"> <li>• Optimal: 27 in. (68.6 cm), for best access to mounting hardware</li> <li>• Optional: 30, 36, or 42 in. (76.2, 91.4, or 106.7 cm) and other standard depths allowed, allow less space for cable management</li> </ul>
<b>Equipment Rack Specifications (continued)</b>	

**Table 3-2 8-Slot Line Card Chassis and Equipment Rack Specifications (continued)**

Load (weight) rating	<p>The rack must support the following weights and specifications:</p> <ul style="list-style-type: none"> <li>• 650 lb (294.8 kg) single chassis with full cosmetics</li> <li>• 1300 lb (589.7 kg) two chassis, each with full cosmetics</li> <li>• 95 lb (43.0 kg) or more for each chassis for cabling</li> <li>• Additional weight of other components in rack</li> </ul> <p><b>Note</b> ANSI specification T1.336 (2003), which defines static load and safety margins, recommends that racks be designed to support at least two times the anticipated load.</p> <p><b>Note</b> See ANSI specification T1.329 (2002) for dynamic load requirements and earthquake resistance specifications.</p>
Chassis and rack footprint (floor contact area)	5.9 sq. ft (0.55 sq. m), 23.6 in. rack width by 36 in. chassis length
Maximum floor loading	<p>600 lb/4.5 sq. ft = 133 lb/sq. ft (without cosmetics or doors)      272.2 kg/4134.2 sq. cm = .07 kg/sq. cm</p> <p>650 lb/4.9 sq. ft = 132.7 lb/sq. ft (with cosmetics and doors)      294.8 kg/4580.1 sq. cm = .06 kg/sq. cm</p> <p><b>Note</b> Be sure to include the weight of the rack when you consider floor loading requirements. The above numbers do not include rack weight.</p>
<b>Rack Anchoring</b>	
General considerations	<ul style="list-style-type: none"> <li>• The rack must be bolted to the floor. For more information, see the <i>Cisco CRS-1 Carrier Routing System Line Card Chassis Unpacking, Moving, and Securing Guide</i>.</li> <li>• Consider floor and overhead anchoring requirements for the site, and size and load capacity of anchors and floor structure.</li> <li>• Make sure that floor mounting bolts are accessible, especially if annual retorquing of bolts is required.</li> <li>• Outrigger L-brackets: 20.1-inch (51.0 cm) wide x 31.6-inch (80.3 cm) deep</li> <li>• Internal frame holes: 17.625-inch (44.77 cm wide) x 21-inch (53.34 cm) deep</li> <li>• For all other racks, check with rack manufacturer.</li> </ul>
<b>Chassis Clearances</b>	
Two chassis in a single rack	0.5-inch (1.27 cm) between chassis for horizontal shelf brackets
Front and rear of chassis	40.4-inch (102.6 cm) for chassis installation 36-inch (91.4 cm) for service access and airflow
Inlet and exhaust openings on chassis and power modules	6-inch (15.2 cm)
Top of chassis	No overhead clearance for a single chassis. Two chassis in a rack requires 0.5-inch (1.27 cm) between chassis for mounting rails.

**Table 3-2 8-Slot Line Card Chassis and Equipment Rack Specifications (continued)**

<b>Equipment Rack Specifications (continued)</b>	
<b>Mounting Rails and Hardware</b>	<ul style="list-style-type: none"> <li>• 17.75 in. (45.1 cm), side to side</li> <li>• 22.8 in. (57.9 cm), front to back (adjustable or fixed)</li> </ul> <p>The equipment rack should contain horizontal mounting rails to place the chassis on. The mounting rails, which must be able to hold at least 650 lb (294.8 kg), support the weight of the chassis.</p> <ul style="list-style-type: none"> <li>• ESW 27 racks are equipped with horizontal mounting rails already installed. Place the chassis on these rails.</li> <li>• For other types of racks, a set of brackets is included in the chassis installation kit, which is available as an option (CRS-8-INSTALL-KT=). Install these brackets and place the chassis on them. For details, see the <i>Cisco CRS-1 Carrier Routing System Line Card Chassis Unpacking, Moving, and Securing Guide</i>.</li> </ul> <p><b>Note</b> In addition to supporting the chassis, the mounting rails are also designed to space adjustable rack rails at 22.8-inches (front to back) for chassis installation.</p>
Mounting holes	<p>EIA standard mounting-hole spacing:</p> <ul style="list-style-type: none"> <li>• 18.25-inches to 18.31-inches (46.36 to 46.51 cm), center-to-center horizontal spacing</li> <li>• <math>0.5 + 0.625 + 0.625</math>-inches (1.27 + 1.59 + 1.59 cm), vertical-hole-spacing pattern; repeats on 1.75-inch (4.45 cm) pitch ETSI racks have mounting rails with EIA standard spacing.</li> <li>• 48 screws for each chassis, 12 screws in each of 4 vertical rails, installed in holes with tick marks</li> <li>• No. 10-32 screws (provided with the chassis)</li> <li>• No. 10-24 or M5 screws can be used if rack thread pitch allows.</li> </ul> <p><b>Note</b> If you plan to use mounting screws other than the ones shipped with the chassis, make sure that the screws are made of stainless steel or a hard alloy. Do not use screws made of soft alloy steel.</p>
<b>Compliance</b>	<p>Make sure that the rack complies with all appropriate standards for your geographical area—for example, NEBS Seismic Zone 4 (GR-63-CORE, Sections 4.4.1 and 4.4.2).</p> <p><b>Note</b> The 8-slot chassis has passed Cisco Zone 4 seismic testing in an ESW 27 rack (part number F-01941-01).</p>
<b>Additional Rack Considerations</b>	<p>Interface cables</p> <p>When choosing a rack, consider cabling needs (chassis front). Allow at least 95 lb (43.1 kg) weight for each chassis for cables.</p>

# Environmental Specifications

The following table lists the environmental specifications for the Cisco CRS-1 8-slot line card chassis.

**Table 3-3 8-Slot Line Card Chassis Environmental Specifications**

Description	Value
Temperature	Operating, nominal: 41° to 104°F (5° to 40°C) Operating, short-term: 23° to 122°F (-5° to 50°C) Nonoperating: -40° to 158°F (-40° to 70°C)
Humidity	Operating: 5 to 85% noncondensing Nonoperating: 5 to 90% noncondensing, short-term operation
Altitude	1 to 5906 ft (-60 to 1800 m) at 122°F (50°C), short-term Up to 13,123 ft (4000 m) at 104°F (40°C) or below
Heat dissipation	27,350 BTU per hour
External cooling requirements	2.3 tons
Chassis airflow	Up to 900 cubic feet (25,485 liters) per minute
Power system airflow	Up to 240 cubic feet (6800 liters) per minute
Acoustic noise 3.3 ft (1 m) from chassis	76 dB—80°F (27°C) or lower (fan speed 4000 RPM) 86 dB—104°F (40°C) or higher (fan speed 6500 RPM) 90 dB—failure condition (fan speed 7500 RPM)
Shock and vibration	Designed and tested to meet the NEBS shock and vibration standards defined in GR-63-CORE (Issue 2, April 2002).



# CHAPTER 4

## Site Planning Considerations

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This chapter describes the general considerations to address while planning for the installation of the Cisco CRS-1 8-Slot Line Card Chassis. It does not repeat the specifications in Chapter 3, but you should keep those specifications in mind as you plan for your system.

This chapter includes the following sections:

- [Basic Site and Installation Planning](#)
- [Tools Required for Installation](#)
- [Equipment Rack Considerations](#)
- [Aisle Spacing and Maintenance Access Floor Plan](#)
- [Power and Cooling Requirements](#)
- [System Console](#)
- [Cable Management](#)
  - [Route Processor Cables](#)
  - [PLIM Interface Cables](#)
  - [Custom Cables](#)
- [Noise Control](#)
- [Cisco Installation Services](#)
- [System Testing, Certification, and Warranties](#)

## Basic Site and Installation Planning

As you plan for basic site and installation requirements, consider the following:

- Does the installation site have adequate power for the routing system?
- Can the routing system be positioned close to the AC or DC power source, and are the power receptacles easy to reach?
- Does the site have appropriate equipment racks with space available in which to install the system? Are additional equipment racks required? See the “[Equipment Rack Specifications](#)” section on [page 3-2](#) for information about rack requirements.
- Is there a scissor lift or similar lifting device available to lift the chassis into the equipment rack?

In addition, make sure that the installation site meets the following access requirements:

**Tools Required for Installation**

- At least 48 inches (122 cm) of clearance exists between rows of equipment racks. This space is needed to access components in the chassis. Additional clearance may be necessary for installation.
- Enough room exists for the system console terminal, and that the console cable is long enough to reach the routing system from the terminal.
- Fan tray exhaust vents are not blocked, and airflow at the bottom of the chassis is not blocked.

When planning the site, you should think about potential expansion of the system. Consider the following:

- Equipment rack space for additional chassis
- Power and cooling requirements for additional chassis
- Cable management for routing system cables

## Tools Required for Installation

The following tools are required to install the Cisco CRS-1 8-Slot Line Card Chassis:

- Safety hand truck, pallet jack, or forklift to move the equipment to the installation site. Make sure that the device is capable of preventing the router from tipping. For example, you could use a safety hand truck with retractable safety leg wheels and a security strap, such as the Stevens Appliance Truck Company “Escort,” Model STEV SRT-M-66 (distributed by McMaster-Carr as Model 2654T6) or an equivalent safety hand truck.
- A scissor lift or similar lifting device to position the chassis in the rack and hold the chassis in place while you bolt it to the rack.
- Electric screwdriver or cordless drill (optional, but helpful)
- 5/32-inch insert bit that fits 1/4-inch drive extension (preferably magnetic, and one that fits in a cordless drill)
- 1/4-inch drive socket
- 1/4-inch drive extension and 1/4-inch drive flexible extension, length of 6 inches (15.24 cm)
- Phillips-head number 1 and number 2 screwdrivers
- 7-mm wrench or 7-mm nut driver or socket (if unavailable, use 9/32-inch standard tools)
- 8-mm wrench
- 10-mm wrench
- Crescent wrench
- 5/16-inch socket wrench
- M6 hex socket screwdriver
- Large and small socket wrenches
- Allen wrench
- Large, medium, and small Phillips screwdrivers
- Large, medium, and small flat-blade screwdrivers
- ESD-preventive wrist strap
- Antistatic mat
- Scissors

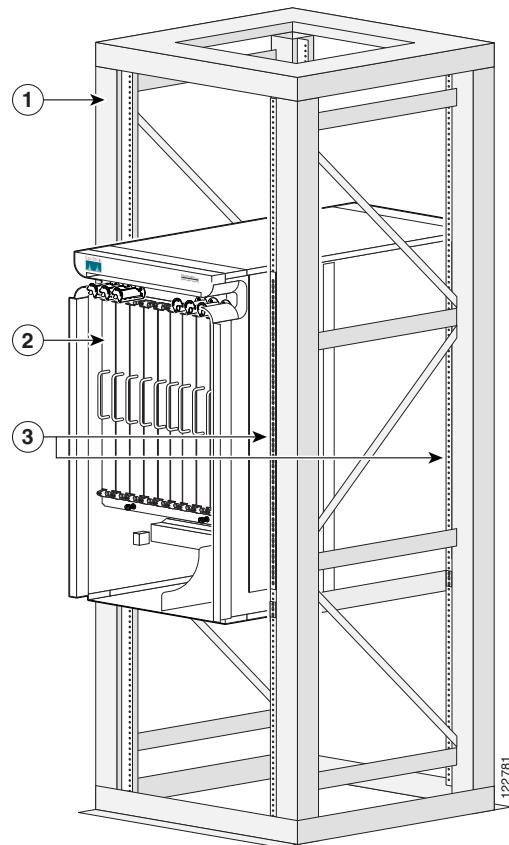
- Tape measure (optional)

## Equipment Rack Considerations

A fully loaded Cisco CRS-1 8-slot line card chassis weighs 650 lb (294.8 kg). The chassis is mounted in a four-post rack. (See [Figure 4-1](#).)

To ensure safe installation and operation of the routing system, you must install the chassis in a four-post equipment rack that meets the specifications described in the “[Equipment Rack Specifications](#)” section on page 3-2.

**Figure 4-1**      **8-Slot Line Card Chassis Mounted in an Equipment Rack**



<b>1</b>	Equipment rack	<b>3</b>	Vertical mounting brackets
<b>2</b>	8-slot line card chassis		



**The chassis should be mounted on a rack that is permanently affixed to the building.** Statement 1049

**Note**

We recommend that you use a scissor lift or similar lifting device to position the chassis in the rack and to hold the chassis in place while you bolt it to the rack. *A forklift is not recommended for this purpose.*

As you plan the installation of the chassis into the equipment rack, consider the following:

- Make sure that the floor mounting bolts on the equipment rack are accessible, especially if annual retorquing of bolts is required.
- For chassis installation, you must have access to the vertical mounting rails at each corner of the equipment rack.
- Consider whether the area around the rack is large enough to accommodate the scissor lift (or similar lifting device) and installation personnel.
- A minimum of 48 mounting screws (provided with the chassis) are needed to secure the chassis to the rack. To secure the chassis to the rack, you install 12 screws in each of the four corners of the rack.
- The rack should have horizontal shelf brackets to place the chassis on. The brackets must be able to support at least 650 lb. (294.8 kg). If the rack does not have horizontal mounting rails, a set of rails is included in the installation kit, which is available as an option (CRS-8-INSTALL-KT=).

**Caution**

Standard rack-mounting screws are not strong enough to secure the chassis to the equipment rack. Use only those mounting screws that are shipped with the chassis or those listed in the “[Equipment Rack Specifications](#)” section on page 3-2.

For complete instructions on mounting and securing the chassis to a rack, see the *Cisco CRS-1 Carrier Routing System 8-Slot Line Card Unpacking, Moving, and Securing Guide*.

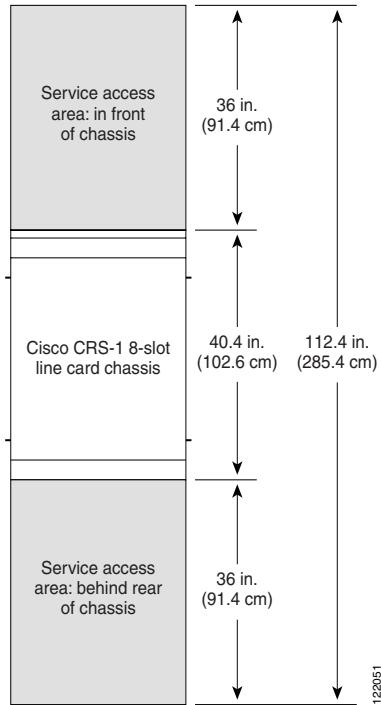
## Aisle Spacing and Maintenance Access Floor Plan

The floor plan for the Cisco CRS-1 must include enough space to install the 8-slot line card chassis in the equipment rack and allow sufficient airflow for the system. The floor plan must also provide enough room to access chassis components for maintenance (for example, to remove fan trays, power modules, cables, and air filters).

[Figure 4-2](#) shows a top view of the Cisco CRS-1 8-slot line card chassis footprint required for installation (with optional front and rear cosmetics installed).

**Note**

For chassis installation, make sure that enough room exists in front of the chassis to accommodate installation personnel and the scissor lift (or similar lifting device) used to hold the chassis in the rack while it is bolted in.

**Figure 4-2****Typical Cisco CRS-1 8-Slot Line Card Chassis Floor Plan**

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## Dimensions of the 8-Slot Line Card Chassis

The dimensions for the Cisco CRS-1 8-slot line card chassis are:

- Chassis depth (including closed (optional) front and rear doors and an installed cable management bracket): ~35 to 40 in. (88.9 to 101.6 cm)
- Chassis height: 38.5 in. (97.8 cm)
- Chassis width: 17.5 in. (44.5 cm).


**Note**

Because there is no external switch-fabric interconnection cabling on a single line card chassis system, the rear door is optional.

## Front and Rear Clearances

The site requires the following front and rear clearances for chassis installation and maintenance access:

- To install the chassis in the equipment rack: 40.4 inches (102.6 cm)
- To service components and allow system airflow (both in front of and behind the chassis): 36 inches (91.4 cm)


**Note**

Maintain at least 6 inches (15.2 cm) of clearance at both the inlet and exhaust openings on the chassis and on the power modules to allow sufficient airflow.

# Power and Cooling Requirements

See [Chapter 2, “Power and Cooling,”](#) for information about the power and cooling systems on the 8-slot chassis and for information about the power and cooling requirements at the installation site.

## System Console

A system console is required to configure the routing system for operation. As you plan your site facilities, make sure that the site has enough room for a system console and the console cable is long enough to reach the routing system.



**Note** The console port does not support modem control or hardware flow control. The port requires a straight-through EIA/TIA-232 cable.

## Cable Management

As the size of the routing system increases, the cabling required for the chassis increases. For example, a fully loaded 8-slot line card chassis has more cables connected to it than a partially loaded chassis. The cabling runs must be carefully planned. The basic configurations for various routing systems should be arranged to minimize the complexity and length of the cable runs. Precut and terminated cables are considered part of the basic configuration.

- CONSOLE or AUX RJ-45 RS-232 serial ports on the route processor cards for terminal connections
- Ethernet ports on the route processor cards for connecting network management equipment
- Modular service cards (MSCs) and physical layer interface modules (PLIMs) for data connections

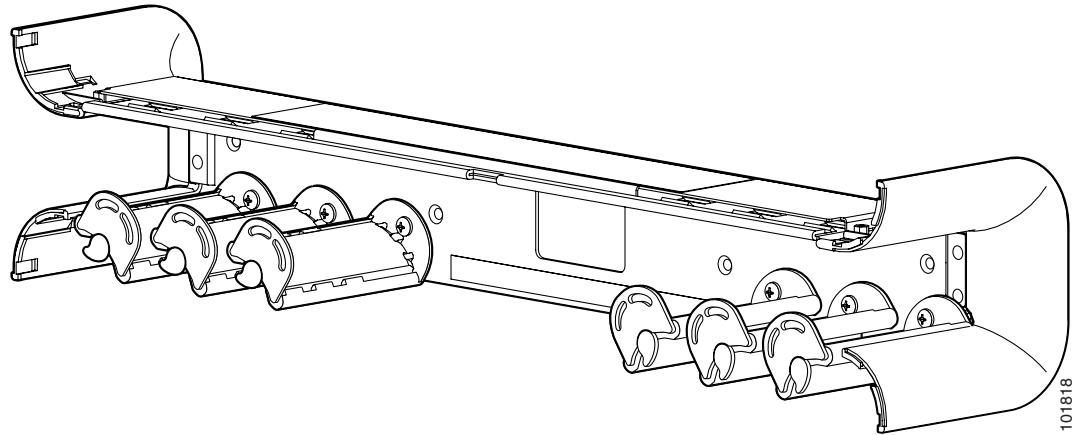
The cable-management bracket is for organizing these interface cables to keep the front of the chassis clear and to eliminate sharp bends in the cables.



**Caution** Excessive bending can damage interface cables.

The cable-management bracket has a special telescoping feature that allows the bracket to be extended when the chassis is upgraded with higher-density cards. This extension feature also helps in installing the cables in the chassis.

[Figure 4-3](#) shows the chassis cable-management bracket.

**Figure 4-3** Cable Management Bracket (Front of Chassis Only)

## Route Processor Cables

As you consider system cabling, see [Table 4-1](#) to determine the types of cables required to connect to ports on the route processor (RP).

**Table 4-1** Route Processor Cables

RP Port	Required Cable Type
Ethernet management	Shielded twisted-pair (STP) cable (Category 5 or better). Required for enhanced immunity to external electromagnetic disturbance levels of 10 V/m and 10 Vrms.
Alarm	Shielded cable. Required for EMC compliance.

## PLIM Interface Cables

You must provide the PLIM interface cables. Because the type and number of interfaces can vary, plan these cable runs prior to the installation. When planning the cable runs, consider the following:

- Number and type of interface connections (OC-48/STM-16, OC-192/STM-64, OC-768/STM-256, and 10-Gigabit Ethernet)
- Termination at the other end of the cables (such as patch panel or optical transport equipment)
- Proper length and termination of cables

## Custom Cables

The installation site may require custom cables designed for the facilities. Cisco can assist you in planning custom cables.

## Noise Control

A routing system can generate large amounts of fan noise. The 8-slot line card chassis has some built-in noise reduction, such as fan speed control. If the routing system is installed in an environment where excessive noise could be harmful to personnel, some other noise reduction options could be attempted. Passive noise reduction could include the installation of foam panels to insulate the surrounding area from the noise.

Additional noise-reduction measures have to be designed on an individual site basis.

## Cisco Installation Services

Cisco or a Cisco partner can provide a complete installation, from planning to power up. For information about Cisco or Cisco partner installation services, consult Cisco Customer Advocacy.

## System Testing, Certification, and Warranties

After the routing system has been installed, it must be tested and certified. Consult Cisco Customer Advocacy for information about testing, certification, and warranties.



## APPENDIX

# A

## Site Planning Guidelines

This appendix contains the following sections:

- Site Planning Checklist
- Preliminary Site Survey

## Site Planning Checklist

Table A-1 lists the sequence of tasks to perform as you plan the installation of the routing system. Use the table as a checklist for all aspects of the installation. For information about a particular task, see the appropriate section of this site planning guide. After completing the checklist, you should consult your Cisco installation coordinator for a site-readiness inspection.

**Table A-1**      *Routing System Installation Checklist*

Site Planning Steps	See	Check
1. Determine where to install the routing system and make sure that you have the appropriate installation and configuration tools.	"Basic Site and Installation Planning" section on page 4-1 "Tools Required for Installation" section on page 4-2	
2. Consider equipment arrival, storage, and transport to the installation site.	"Basic Site and Installation Planning" section on page 4-1 "Basic Site and Installation Planning" section on page 4-1	
3. Make sure that the equipment rack meets the installation requirements.	"Equipment Rack Specifications" section on page 3-2 "Equipment Rack Considerations" section on page 4-3	
4. Consider the space where the routing system will be installed.	"Aisle Spacing and Maintenance Access Floor Plan" section on page 4-4	
5. Plan for power (AC or DC).	Chapter 2, "Power and Cooling" "Line Card Chassis Specifications" section on page 3-1	
6. Consider cooling and airflow requirements.	"Chassis Airflow" section on page 2-10 "Facility Cooling Requirements" section on page 2-10 "Environmental Specifications" section on page 3-6	
7. Consider cable management.	"Cable Management" section on page 4-6	
8. Consider Cisco installation services.	"Cisco Installation Services" section on page 4-8	

■ Preliminary Site Survey

# Preliminary Site Survey

Typically, you should complete a preliminary site survey before you plan a detailed site survey. This preliminary survey ensures that the basic system requirements have been completed or are underway before detailed plans for the site are completed. [Table A-2](#) is a sample preliminary site survey.

**Table A-2      Sample Routing System Preliminary Site Survey**

<b>Preliminary Site Survey</b>	
<b>Order Information</b>	
Sales order number:	
Estimated shipping date:	
Site ready date:	
Installation date:	
<b>Site Location and Address</b>	
Company name:	
Site address:	
Shipping address:	
Building or computer room access:	
Special instructions:	
Hours and days of operation:	
<b>Site Survey Contacts</b>	
<b>Primary Contact</b>	
Name and title:	
Phone number:	
Mobile phone number:	
Fax number:	
Pager number:	
E-mail address:	

**Table A-2 Sample Routing System Preliminary Site Survey (continued)**

<b>Preliminary Site Survey</b>	
<b>Secondary Contact</b>	
Name and title:	
Phone number:	
Mobile phone number:	
Fax number:	
Pager number:	
E-mail address:	
<b>Delivery and Installation Constraints</b>	
Is there a loading dock available to unload the equipment at this site?	
Is someone on site during working hours to accept delivery of the materials? If not, list the times this person is available.	
Are there any special requirements for equipment delivery (for example, special delivery times, the need for escorts or IDs, or safety procedures to follow, such as hard hats, safety glasses, and so on)?	
Is the path to the installation area clear? If not, can arrangements be made to move the equipment to the installation area? Describe them.	
What floor is the installation site on?	
If it is on a floor other than the ground floor, is there a freight elevator available? Note whether the equipment needs to be brought up a flight of stairs.	
<b>Equipment Rack Mounting</b>	
How many chassis are being installed?	
Are there equipment racks currently available for all chassis to be installed?	
Do the equipment racks meet the installation requirements?	
Make a sketch of the area where the chassis will be installed. Determine how many chassis (1 or 2) will be installed in each equipment rack.	

■ Preliminary Site Survey

**Table A-2 Sample Routing System Preliminary Site Survey (continued)**

<b>Preliminary Site Survey</b>	
<b>Power</b>	
Is DC or AC power available for each chassis? Is there a connection point on the panel for each chassis?	
Is a fuse access panel (FAP) available for the equipment? Provide a connection point on the FAP for each chassis.	
Will an FAP be installed in time for the routing system installation? Provide a date when the FAP will be installed.	
Is the FAP located in the same room as the chassis?	
Is there an AC power outlet (220 V or 110 V) located within 10 feet of each chassis, for PCs and test equipment?	
Has proper grounding been provided for the equipment? If not, when will the grounding be available? Provide a connection point for the grounding.	
Are there any restrictions about when the equipment can be powered on or when electrical work can be done? If so, describe them.	
Are there special requirements for power or power cables (for example, a different gauge of wire)? If so, describe them.	
<b>Air Conditioning</b>	
Does the site have the air conditioning capacity to handle the routing system? If not, note what will be done to rectify the lack of adequate cooling.	
Describe the air conditioning at the site.	
<b>Control Plane and Alarm Interfaces</b>	
Will the chassis be connected to an external alarm system? Has the cabling been considered?	

**Table A-2 Sample Routing System Preliminary Site Survey (continued)**

<b>Preliminary Site Survey</b>	
<b>Supported Data Interfaces</b>	
Will the routing system be connected to OC-48/STM-16 POS circuits? How many ports?	
Will the routing system be connected to OC-192/STM-64 POS circuits? How many ports?	
Will the routing system be connected to OC-768/STM-256 POS circuits? How many ports?	
Will the routing system be connected to 10-Gigabit Ethernet (GE) circuits? How many ports?	
<b>Cable Management</b>	
Have the cables been pulled for the data interfaces? If not, list the outstanding cabling that needs to be installed and the scheduled completion dates.	
Are there connection points on the fiber distribution panel for all optical cables connecting to the routing system?	
Who will provide fiber jumpers? What length of fiber jumper is required to complete the installation?	
What type of fiber connector is used at the installation site?	
If attenuation is required, are attenuators available at the installation site? If not, who will pay for the attenuators?	

■ Preliminary Site Survey



## APPENDIX

# B

## Product IDs for the Cisco CRS-1 8-Slot Line Card Chassis

This appendix provides information about the product IDs for components of the Cisco CRS-1 Carrier Routing System 8-Slot Line Card Chassis. It contains the following tables:

- [Cisco CRS-1 8-Slot Line Card Chassis Component Product IDs](#)
- [Optional MSC, PLIM, SIP, and SPA Product IDs](#)

These tables list the components that make up the routing system, their product IDs (the part numbers to use to order the components), and descriptions.



**Note**

Although this appendix provides product IDs for routing system components, the Cisco online ordering and pricing tool has the most up-to-date information on the routing system and product IDs. You can access the ordering tool at the following URL (CCO login required), and enter a search term such as “CRS” or “CRS-1” to view a list of components:

<http://www.cisco.com/cgi-bin/front.x/pricing>

## Cisco CRS-1 8-Slot Line Card Chassis Component Product IDs

The following table lists the product IDs for components in the Cisco CRS-1 8-slot line card chassis.

**Table B-1      8-Slot Routing System Component Product IDs**

Component	Product ID	Description
CRS-1 8-slot routing system	CRS-8/S	Cisco CRS-1 8-slot routing system
CRS-1 8-slot line card chassis	CRS-8-LCC=	Cisco CRS-1 8-slot line card chassis (spare chassis)
Fan tray	CRS-8-LCC-FAN-TR=	Cisco CRS-1 8-slot fan tray and fans (spare) (2 required for each chassis)
Air filter	CRS-8-LCC-FILTER=	Line card chassis filter pack (spare)
Inlet grille	CRS-8-FRNT-GRILL=	Line card chassis inlet air grille

**Cisco CRS-1 8-Slot Line Card Chassis Component Product IDs****Table B-1 8-Slot Routing System Component Product IDs (continued)**

<b>Component</b>	<b>Product ID</b>	<b>Description</b>
Installation kit	CRS-8-INSTALL-KT=	Line card chassis installation kit (includes a set of horizontal shelf brackets, mounting screws, and other items)
<b>Power Components</b>		
Power module filter	CRS-8-PWR-FILTER=	Filters (five per pack) for AC rectifier and DC PEM
<b>AC Delta power components</b>		
AC Delta PDU	CRS-8-LCC-PDU-ACD=	Cisco CRS-1 AC Delta power distribution unit (two required for each chassis)
AC rectifier module	CRS-8-AC-RECT=	Cisco CRS-1 AC rectifier module (two required for each chassis, one for each PDU)
<b>AC Wye power components</b>		
AC Wye PDU	CRS-8-LCC-PDU-ACW=	Cisco CRS-1 AC Wye power distribution unit (two required for each chassis)
AC rectifier module	CRS-8-AC-RECT=	Cisco CRS-1 AC rectifier module (two required for each chassis, one for each PDU)
<b>DC power components</b>		
DC PDU	CRS-8-LCC-PDU-DC=	Cisco CRS-1 DC power distribution unit (two required for each chassis)
DC PEM	CRS-8-DC-PEM=	Cisco CRS-1 DC power entry module (PEM) (two required for each chassis, one for each PDU)
<b>Switch fabric card</b>		
Switch fabric card	CRS-8-FC/S=	Cisco CRS-1 switch fabric card (half-height) (four required for each chassis)
Switch fabric blank	CRS-8-FC-BLANK=	Blank card carrier for each switch fabric slot (used during shipment, must be replaced by a switch fabric card)
Switch fabric handle	CRS-8-FC-HANDLE=	Handle for carrying card (spare)
<b>Route processor card</b>		
Route processor	CRS-8-RP=	Cisco CRS-1 route processor (RP) card (one required for each chassis; for redundant operation, you also need CRS-8-RP/R=)
Route processor, redundant	CRS-8-RP/R=	Optional route processor for redundant RP operation (one required for each chassis, along with CRS-8-RP=)
Route processor memory	CRS-MEM-2G=	RP memory module, 2 gigabytes
Route processor blank	CRS-8-RP-BLANK=	Blank card carrier for each route processor slot (used during shipment, must be replaced by a route processor card)
Route processor handle	CRS-8-RP-HANDLE=	Handle for carrying card (spare)

# Optional MSC, PLIM, SIP, and SPA Product IDs

The following tables list the product IDs for the modular services cards (MSCs) and physical layer interface modules (PLIMs) available for the Cisco CRS-1 8-slot line card chassis.

**Table B-2** *MSC Component Product IDs*

Component	Product ID	Description
MSC (line card) <sup>1</sup>	CRS-MSC CRS-MSC-B	Cisco CRS-1 Layer 3 MSC (every MSC must have an associated PLIM)
MSC impedance carrier	CRS-MSC-IMPEDANCE=	Blank card carrier for each empty MSC slot (required for EMI compliance and cooling)

1. Refer to the product data sheet for ordering details.

i

**Table B-3** *PLIM Component Product IDs*

Component	Product ID	Description
1xOC-768 PLIM	1OC768-POS-SR=	1-port OC-768c/STM-256c PLIM, with short-reach optics (POS)
4xOC-192 PLIM	4OC192-POS/DPT-LR=	4-port OC-192c/STM-64c PLIM, with long-reach optics (POS or DPT)
	4OC192-POS/DPT-IR=	4-port OC-192c/STM-64c PLIM, with intermediate-reach optics (POS or DPT)
	4OC192-POS/DPT-SR=	4-port OC-192c/STM-64c PLIM, with short-reach optics (POS or DPT)
	4OC192-POS/DPT-VS=	4-port OC-192c/STM-64c PLIM, with very-short-reach optics (POS or DPT)
16xOC-48 PLIM	16OC48-POS/DPT=	OC-48c/STM-16c PLIM, uses small form-factor pluggable (SFP) modules (POS or DPT)
	POM-OC48-LR2-LC-C=	The PLIM uses 1 to 16 single-mode, long- and short-reach optic modules (mixing allowed):
	POM-OC48-SR-LC-C=	<ul style="list-style-type: none"> <li>• Long-reach optics (POM-OC48-LR2-LC-C=)</li> <li>• Short-reach optics (POM-OC48-SR-LC-C=)</li> </ul>
8x10-GEPLIM	8-10GBE=	10-GE PLIM, uses XENPAK optic modules
	CRS-XENPAK10GB-LR=	The PLIM uses 1 to 8 single-mode, long-reach optic modules:  Long-reach optics (CRS-XENPAK10GB-LR=)
PLIM impedance carrier	CRS-INT-IMPEDANCE=	Blank card carrier for each empty PLIM slot (required for EMI compliance and cooling)

■ Optional MSC, PLIM, SIP, and SPA Product IDs

**Table B-4 SIP and SPA Component Product IDs**

Component	Product ID	Description
Cisco CRS-1 SPA Interface Processor-800	CRS1-SIP-800	Occupies one physical-layer-interface-module (PLIM) slot on the Cisco CRS-1 16-and 8-Slot Line Card Chassis. Supports six normal-height SPAs or three double-height SPAs or any combination in between.
1-Port OC-192c/ STM-64 POS/RPR XFP SPA	SPA-OC192POS-XFP	
4-Port OC-3c/STM-1 POS SPA	SPA-4XOC3-POS	
8-Port OC-12c/STM-4 Multirate POS SPA	SPA-8XOC12-POS	
8-Port Gigabit Ethernet SPA	SPA-8X1GE	



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